

Minimal invasive approach to managing pediatric patients

Abstract

As clinicians, we can relate to difficulties in managing and treating children with dental caries, although there are methods like behaviour management, sedation and general anesthetic in managing children. Besides the additional cost and time associated with these methods, most dentists might not have the know-how or facilities to carry out these techniques. The aim of this article is to highlight minimal and non-invasive methods of managing dental caries. During the Covid 19 pandemic, having treatment options that are none or reduced aerosol-generating along with shorter treatment times is an added benefit.

Keywords: dental caries, children, fluoride, treatment

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Abbreviations: ICDAS, International caries detection and assessment System; SDF, silver diamine fluoride; ART, atraumatic restorative technique; ITR, interim therapeutic restoration; EDJ, enamel dentine junction

Introduction

Dental caries is a biofilm-mediated, sugar-driven, multifactorial, dynamic disease that results in the imbalance of demineralization and remineralisation of dental hard tissues.¹ It can be diagnosed by cleaning and drying the tooth and having good lighting along with good tactile sensation with a blunt probe.²

As dental caries is progressive, to determine how severe the carious lesion is, a classification system by the International Caries Detection and Assessment System (ICDAS) is commonly used to stage the severity of dental caries.³

As we move to a modern approach for the management of caries, it is important to take into account the activity, location and cavitation of the carious lesion when determining the management. Non-cavitated lesions and cavitated lesions in a cleansable area should be managed via the minimally invasive approach.⁴ Minimally invasive treatment can be classified into two categories, non-invasive treatment and micro-invasive treatment. In a world where COVID-19 is occurring, having treatment options that are reduced or non-aerosol generating along with shorter treatment times is encouraged. This means that children are still able to go to a dental practice for treatment, while reducing risk of COVID-19.

Non-invasive treatment

Fluoride varnish

Fluoride varnish is a topical fluoride that is professionally applied. It has a fluoride concentration of 22,600ppm. It has a colloidal hydrophobic matrix that is dissolved in ethanol and attaches onto the enamel. This allows for slow release of fluoride onto the teeth. As the concentration of fluoride is very high, it is important to remember not to apply too much to prevent overdose of fluoride. Hence, in a child of 2-5 years old, a maximum of 0.25ml can be applied and in a child of 5-7 years old, a maximum of 0.4ml can be applied.⁵

Due to the extremely high fluoride content in fluoride varnish, it has been proven effective in treating non-cavitated carious lesions

encouraging remineralisation of the carious lesion.⁶ By applying fluoride varnish twice a year, it is also a good method of caries prevention in children above the age of two with high caries risk.⁶ Fluoride Varnish can reduce the risk of caries by 33%.⁷

Silver diamine fluoride (SDF)

Silver diamine fluoride (SDF) is a colorless alkaline solution that contains both silver and fluoride that acts synergistically to arrest carious lesions.⁸ It has a fluoride concentration of 44,800ppm.⁶ The silver in the solution is bactericidal and the fluoride aids in inhibiting demineralization and promoting remineralisation of demineralized enamel and dentine.⁸ It addition, it has been shown that SDF arrests over 80% of caries.⁹ Along with being very effective at arresting caries, SDF is economical and does not require many instruments or difficult techniques for application.⁹ When SDF is applied to cavitated lesions, it also has a positive effect on the rest of the mouth in caries prevention.¹⁰

Having mentioned the above, there is a drawback of SDF and that is that it turns the carious lesions black, so it is very important that both the child and parents are aware of the side effects before using SDF for caries treatment.

Fissure sealants

Fissure sealant is another non-invasive method that can be used to successfully restore non-cavitated occlusal caries lesions. It has been shown to seal occlusal caries as deep as the middle third of dentine.¹¹ A study by Jensen et al in 1980 found out that just by acid etching the tooth in preparation for fissure sealing the tooth, it led to reduction of viable organisms by 75%.¹² The study also looked at 106 molar teeth and which were re-entered at different times after fissure sealing them. They found that there was a linear decrease in viable organisms with an increase in time, after 12 months there was a 99.9% reduction in viable organisms.¹²

Fissure sealants can be used for caries prevention and caries treatment. There are resin sealants and glass ionomer sealants. Fissure sealants have a role in caries prevention, by sealing the pits and fissures on the occlusal surface of molars, it prevents food from trapping in the area, which eliminates formation of biofilm.¹³ Furthermore, by sealing the non-cavitated carious lesion, it inhibits the progression of caries.¹³ While resin sealants are more retentive, the glass ionomer material

is more hydrophilic, making it the more suitable choice for sealing partially erupted molar.¹⁴

Minimally invasive treatment

Atraumatic Restorative Technique (ART)

Atraumatic Restorative Technique (ART) can be used as a restoration technique to restore cavitated teeth but also as a fissure sealant. Commonly, a high viscosity glass ionomer is used on the tooth with a finger press technique.¹⁴ It was found that ART decreases bacteria levels, increases remineralisation and provides fluoride reservoir.¹⁵ It was found from a study by Frencken and Wolke that even after the high viscosity glass ionomer sealant has disappeared clinically, they are still retained in deeper parts of the pits and fissures.¹⁶ This means that it is still providing caries protective effect on a microscopic level. It can also be combined with SDF, the combination of SDF and ART is called Hybrid or Smart restorative treatment.

Interim therapeutic restoration (ITR)

Interim therapeutic restoration can be used to restore, arrest and prevent the progression of caries in young patients or patients where behaviour is difficult to be managed.¹⁷ It can also be used for step wise excavation of caries.¹⁷ Caries excavation is performed with hand or rotary instruments with an aim to prevent pulp exposure.¹⁷ Similar to ART, the cavity is then sealed with glass ionomer and this technique has been shown to be effective at controlling caries prior to placing a definitive restoration.¹⁷

When doing the step wise excavation technique, caries is removed over two visits. The first visit involves the removal of superficial soft dentine and ensuring that caries around the enamel dentine junction (EDJ) is also removed as this ensures a good seal with either glass ionomer or composite and ideally left for 6 months. This allows for pulp dentine complex reaction to occur. The tight seal leads to the reduction of bacteria thus arresting caries. During the second visit, the provisional restoration is removed along with any remaining soft dentine, this step wise caries excavation has been proven to reduce the risk of pulp exposure in the primary dentition by 69%.¹⁸

Hall crown technique

The hall crown technique has been increasingly used as an option to restore caries deciduous dentition as it does not require local anesthetic or a caries removal.¹⁹ It involves placement on the crown onto an unprepared tooth with aims to arrest caries. While the crown is high in occlusion increasing the occlusal vertical dimension, it will naturally adjust over a few weeks.¹⁹ A study by Innes et al carried out a randomised controlled trial of this technique and found that after 2 years, there were only 2% of major failures (irreversible pulpitis), 5% minor failures (loss of restoration or caries).¹⁹ Case selection is important before embarking on this option, the tooth should be vital and radio graphically, there should be a clear dentine band with no furcation radiolucency.

Conclusion

When deciding on how to manage caries, the depth or severity of caries should be determined both clinically and radio graphically. Along with the clinical picture, there are other factors to consider too, like the child's age, cooperation, behaviour towards the treatment and affordability of the treatment. There is sufficient evidence of how to manage caries lesions with none or minimally invasive techniques.

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None

Conflicts of interest

The author declares no conflicts of interest.

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